

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1****Amendments to the Claims:**

1. (Original) A method for making transmit/discard decisions on individual datagrams including the steps of:

- a) determining pipe membership of said datagrams by testing certain bits in said datagram within each Input Interface Circuit of a network node upstream of the packet forwarding device, the selection of bits made on the basis of standards for constructions of datagrams with one or more of levels of headers and payloads;
- b) providing a table of values indicating transmit probability for each pipe of a predetermined set within each said Input Interface Circuit;
- c) selecting a corresponding value matching said pipe membership of said datagram from said table; and
- d) selectively transmitting or discarding said datagrams responsive to said transmit probability matching said pipe membership.

2. (Original) The method according to Claim 1, wherein the step of selectively transmitting further includes the steps of:

- e) providing a random number generator in the Input Interface Circuit;

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

- f) performing a comparison of a current state of said random number generator with the value of transmit probability taken from said table of values;
 - g) discarding said datagram if the current state of said random number generator is closer than said value of transmit probability to a value representing a state where all datagrams of a pipe are to be transmitted; and
 - h) transmitting said datagram if the current state of said random number generator is not closer than said value of transmit probability to a value representing a state where all datagrams of a pipe are to be transmitted.
3. (Original) The method according to Claim 2, wherein said value representing a state where all datagrams of a pipe are to be transmitted is equal to one and said current state of said random number generator is a nonnegative fraction between 0 and 1.0.
4. (Original) The method according to Claim 1, wherein the step of pipe membership determination further includes the steps of comparing administratively specified values with the value of selected fields in a packet header of said datagrams.
5. (Original) The method according to Claim 4, wherein said selected fields of a packet header comprises the Differentiated Services Code Point (DSCP) field in a standard IP packet header.

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

6. (Original) The method according to Claim 4, wherein said selected fields of a packet header comprises the MPLS (Multiprotocol Label Switching) label or EXP bits or any combination thereof, within the datagram, or ATM VPI/VCI fields also used for MPLS tunnel designation.
7. (Original) The method according Claim 1 wherein said table of values is indexed according to pipe numbers with each corresponding table entry representing the transmit probability corresponding to the associated pipe.
8. (Original) The method according to Claim 1, further comprising the step of altering said values indicating transmit probability responsive to actual offered data rates in each of said pipes relative to guaranteed minimum and / or maximum data rates of those pipes.
9. (Original) The method according to Claim 8, wherein the step of altering said values is further responsive to a signal from said packet forwarding device indicating congestion within that device that affects one or more pipes flowing through said Input Interface Circuit.
10. (Original)The method according to Claim 9, wherein said signal includes multiple components each of which corresponds to congestion within a different output port or group of output ports, said pipes within said Input Interface Circuit are grouped according to which output port or group of output ports they direct data to, and wherein the step of altering said values is performed separately for each group of pipes.

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

11. (Original) An apparatus in an Input Interface Circuit of a packet forwarding device comprising:

a) a table in which pipe numbers and associated probabilities of transmission are stored;

b) a buffer for storing at least a portion of a frame ;

c) a random number generator that periodically outputs random numbers;

d) a controller operatively coupled to the table, the buffer and random number generator, said controller:

parsing the information in the buffer to detect a pipe membership number for said frame,

determining from said table a transmission (transmit fraction) probability value corresponding to the detected pipe membership number,

comparing the probability value with a present value of the random number generator and discarding or forwarding the frame based upon the result of the comparison.

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

12. (Original)The apparatus according to Claim 11, wherein said controller alters said values indicating transmit probability responsive to algorithm constants and actual offered data rates in each of said pipes relative to guaranteed minimum and / or maximum data rates of those pipes.

13. (Original)The apparatus according to Claim 12, further comprising a management component, said management component initializing said algorithm constants and said guaranteed minimum and maximum data rates of pipes.

14. (Original) The apparatus according to Claim 11, further comprising an interface to an external controller not contained within said Input Interface Circuit, said external controller being connected to one or more Input Interface Circuit and altering said values indicating transmit probability responsive to algorithm constants and actual offered data rates in each of said pipes relative to guaranteed minimum and maximum data rates of those pipes within each of the Input interface circuit it is connected to.

15. (Original)The apparatus according to Claim 14, further comprising a management component, said management component initializing said algorithm constants and said guaranteed minimum and maximum data rates of pipes.

16. (Original)The apparatus according to Claim 12, wherein said controller is further responsive to a signal from said packet forwarding device indicating congestion within that device that affects one or more pipes flowing through said Input Interface Circuit in altering

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

said values.

17. (Original) The apparatus according to Claim 14, wherein said external controller is further responsive to a signal from said packet forwarding device indicating congestion within that device that affects one or more pipes flowing through said Input Interface Circuit in altering said values.

18. (Original) The apparatus according to Claims 16 or 17, wherein said signal includes multiple components each of which corresponds to congestion within a different output port or group of output ports, said pipes within said Input Interface Circuit being grouped according to which output port or group of output ports they direct data to, and wherein the altering of said values is performed separately for each group of pipes.

19. (Original) A method that controls the flow of datagrams including the steps of:

- a) providing, in an Input Interface Circuit of a network node, a table identifying pipes and associated transmission probability for each pipe in said table;
- b) for each datagram received in said Input Interface Circuit determining the identity of said datagram by examining bits within said datagram;
- c) correlating datagram identity in step (b) with entries in the table; and
- d) discarding or forwarding a datagram based upon the value of the transmission

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

probability only if the datagram identified in step (b) matches the identity of a pipe in the table.

20. (Original) The method of Claim 19 wherein numerals are used to indicate the identity of pipes and the identity of datagrams.

21. (Original) The method of Claim 20 further including the steps of providing a random number generated; and

discarding or forwarding a datagram based upon the value of the transmission probability and a present value of the random number generator.

22. (Currently Amended) A communication system comprising:

a switch;

a congestion monitoring device operatively coupled to said switch, said congestion monitoring device monitoring transmission in said switch and generating at least one signal indicating congestion state ~~or no congestion state~~ in said switch;

a Physical Device (PHY) operatively coupled to the switch, said PHY receiving and forwarding frames to said switch; and

a frame discard mechanism, located in said PHY, responsive to the at least one signal to discard ~~or forward frames to the switch~~ based upon the state of the signal transmit probability for queues to which said frame is associated.

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

23. (Currently Amended) A method to manage congestion in a communications network comprising the acts of:

operatively monitoring, with a congestion device, traffic within a communications device;

generating at least one signal indicating congestion ~~or no congestion~~ state in said communications device; and

~~using~~ activating a discard mechanism with the at least one signal to discard frames[[,]] based upon transmit probability for queues to which said frames are associated and prior to the ~~communication device~~ initiating processing on the discarded frames, or forward frames to the communications device for processing.

24. (New) A method for managing congestion within a communications network comprising:

examining at least one packet to determine identity of at least one queue to which said packet is being affiliated;

obtaining a transmit probability for the at least one queue based upon the identity so determined;

generating variable parameters with a generator;

comparing the transmit probability with a selected one of said variable parameters;

and

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

discarding a packet with a discard mechanism based upon a predefined result of said comparison.

25. (New) The method of claim 24 wherein obtaining transmit probability includes providing a table including queues paired with transmit probabilities; and

indexing into the table with identity of the at least one queue to select the transmit probability.

26. (New) The method of Claims 24 wherein the variable parameters include random numbers from a random number generator.

27. (New) The method of claim 26 wherein the predefined result includes the transmit probability \leq to a selected one of the random numbers.

28. (New) A method for managing congestion within a communications network comprising:

examining at least one packet to determine identity of at least one queue to which said packet is being affiliated;

obtaining a transmit probability for the at least one queue based upon the identity so determined;

generating variable parameters with a generator;

SERIAL NO. 09/764,954**PATENT
Docket RAL920000117US1**

comparing the transmit probability with a selected one of said variable parameters;
and

forwarding the at least one packet based upon a predefined result of said
comparison.

29. (New) The method of claim 28 wherein the predefined result includes the transmit
probability \geq to a selected one of the variable parameters.